

Brookhaven National Laboratory/ LIGHT SOURCES DIRECTORATE				
<b>Subject:</b>	<b>Securing the X-Ray Tunnel</b>			
<b>Number:</b>	LS-OPS-0001	<b>Revision:</b>	C	<b>Effective:</b> 7/16/2008
Prepared/approved By: M. Buckley		Approved By: R. Church		Approved By: J. Aloï

\*Approval signatures on file with master copy.

[Revision Log](#)

## 1.0 PURPOSE

The purpose of these instructions is to provide guidance for the Operations Group personnel and other qualified persons performing an X-Ray tunnel search for operational purposes and how to Un-Secure/break security from a secured X-Ray Tunnel.

## 2.0 SCOPE

The X-Ray tunnel is the most extensive of the High Hazard Radiation Areas at the NSLS. To ensure the utmost in personnel safety at the NSLS, personnel listed in "Qualified Search Personnel for NSLS Accelerators" must complete the search of this area or break security in the tunnel to allow personnel access.

## 3.0 RESPONSIBILITY

**Searchers:** The searchers must assure that no person remains inside the X-ray tunnel after the search has been completed. These individuals are also required to assure all main magnet power supplies have been turned off prior to breaking security in the tunnel.

**Control Room Operator:** The on duty Operator must always be aware of the status of the interlocks and in control of the status.

## 4.0 PREREQUISITES

4.1 Two people are required to search the X-Ray tunnel. One of these searchers must be either an Operator or an Operations Coordinator and the other must also be selected from the list of qualified searchers (refer to "Qualified Search Personnel for NSLS Accelerators, LS-ESH-0009").

4.2 Permission for securing the X-Ray tunnel must be given by the Control Room Operator on duty.

4.3 The searchers should determine that all work in the tunnel has been completed and cleanup work done. This often requires a walk around in the tunnel before the search and/or an announcement made using the PA system stating that the tunnel will be secured. Anyone in the tunnel should be asked to leave at this time.

4.4 The Kirk Keys for the "RF System Test Mode" must be in place in the X-Ray security rack.

4.5 Ring interlock faults RIA/RIB should be cleared.

4.6 The emergency exit door must be closed and the fault must be reset at SR100.

4.7 All Red Tags must be removed from the "Security System Red Tag Switch" at SR100.

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## 5.0 Search/Secure X-Ray Tunnel

Refer to [figure 1](#) for the X-Ray tunnel diagram, check station locations, emergency stop locations, and tunnel search paths.

5.1 The actual search must be accomplished without interruption.

- a.) The search must be completed without waiting for work in the tunnel to be completed or without extraneous tasks, such as collecting and carrying objects out of the tunnel during the search.
- b.) If an interruption occurs, the search should be dumped by pressing and then resetting an emergency stop button. The problem(s) must be addressed before attempting to re-search the tunnel.

5.2 The search of the X-Ray tunnel is started and completed at the double doors that provide access to the tunnel.

- a.) The searchers are to hang the "DO NOT ENTER, SEARCH IN PROGRESS" sign on the door before they enter the tunnel.
- b.) The searchers enter the ring though the double doors and the doors are closed.
- c.) Searcher #1 turns right into the tunnel and proceeds to DG/START SEARCH. Searcher #2 turns left into the tunnel and awaits the illumination of the "Interlock" sign (located by DG/START SEARCH) in the tunnel.
- d.) Searcher #1 presses the first Check Station, DG/START SEARCH. Pressing DG/START SEARCH does the following:
  - 1.) Starts the six-minute time limit.
  - 2.) Illuminates the "Interlock" sign inside the tunnel.
  - 3.) Illuminates the "Radiation Area - Entry Is Prohibited" sign over the entrance doors outside of the tunnel.

If either entrance door is opened before the searchers have completed their concentric circuit and are ready to leave, the search will dump and will have to be started over.

e.) Searcher #1 proceeds around the tunnel to CS-1. Searcher #2 proceeds around the tunnel to CS-2.

f.) During the search through the tunnel, the searchers must do the following:

- The searchers must look carefully for any persons who may be in the tunnel. In particular, the "SAWTOOTH" areas must be examined using the mirrors provided and by looking around the magnets.
- **The searchers must announce verbally that the ring is being secured, numerous times throughout the search process.**
- The space between the magnets and the outer wall must be checked.
- In addition, the searchers should check that all plug doors are in place and that the shielding has not been removed from the "WINDOWS" where the beam pipes pass out of the tunnel.

g.) If any person is encountered during the first half of the search, they should be told to move ahead of the searcher toward the entrance doors, but not to open the door since this would dump the search.

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***WARNING - If a person is found in one of the sawtooth areas or on the magnets, the search must be dumped and restarted only after they are out.***

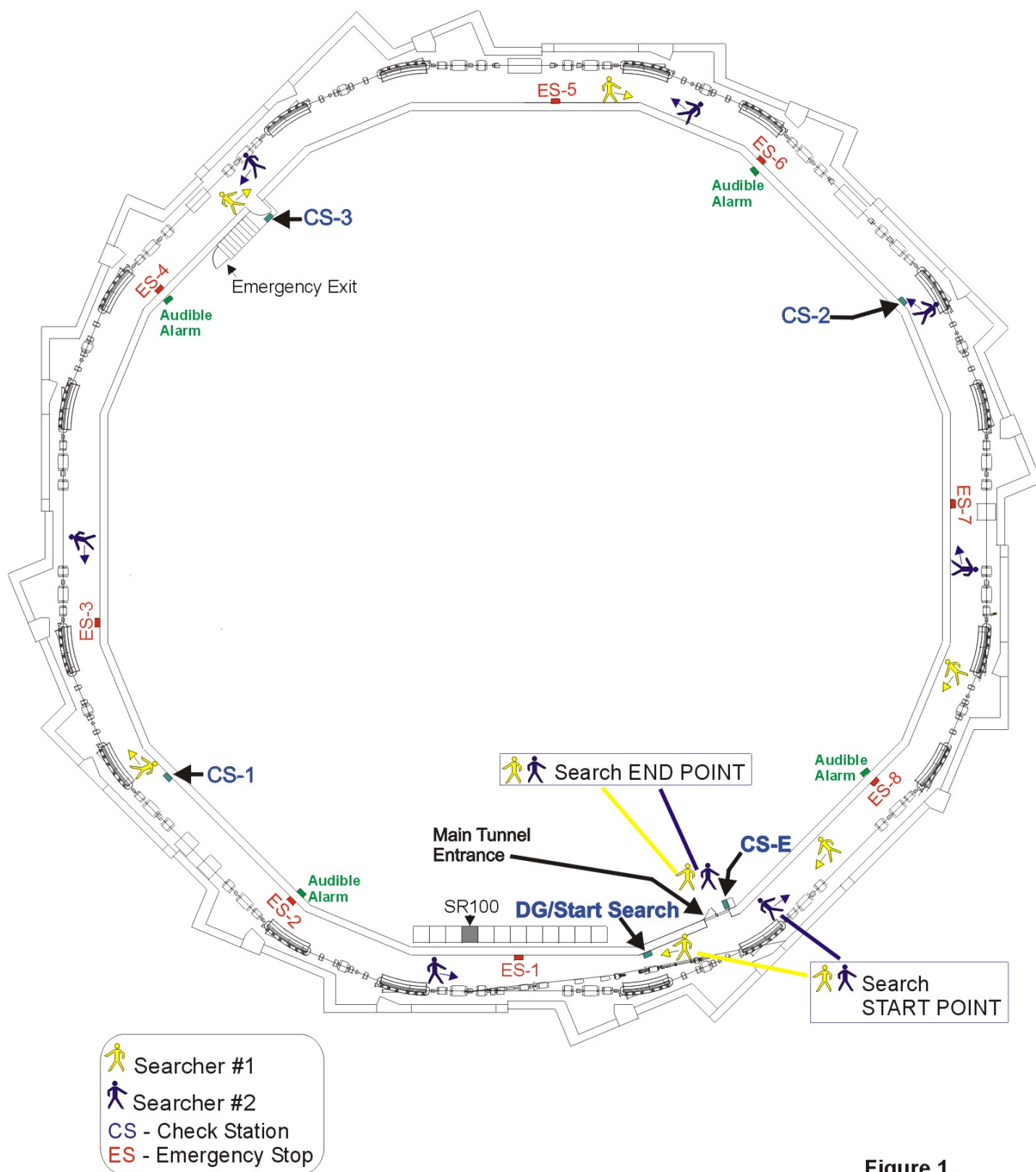
- h.) Searcher #1 presses CS-1 when it is reached. Searcher #2 presses CS-2 when it is reached.
  - The pilot lights on CS-1 & CS-2 remain on, indicating that the search relays are latching properly.
- i.) Both searchers proceed to the 180-degree point where CS-3 is located. The first searcher to reach the 180-degree point waits for the other searcher to arrive.
- j.) One of the searchers guards the tunnel while the other searcher enters the emergency exit area, verifies that no one is there, assures the emergency door is fully closed, and presses CS-3.
  - The pilot light on CS-3 remains on, indicating that the search relays are latching properly.
- k.) Both searchers continue around the tunnel in their original directions and from this point on they must insist that any person encountered must move ahead of them toward the tunnel entrance.
- l.) When both searchers arrive back at the entrance doors, they compare notes and verify that every person who has been in the tunnel is at the entrance and ready to leave.
- m.) Searcher #2 presses check station DG/START SEARCH that provides a ten second interval during which the exit doors may be opened and everyone leaves the tunnel.
- n.) One of the searchers opens the entrance door to the tunnel. Both searchers and all persons encountered during the search exit the tunnel.
- o.) One of the searchers closes the entrance door and removes the Kirk Key.
- p.) The other searcher must then press CS-E until the audible warning is heard from the tunnel.
- q.) The searchers must remove the "Do Not Enter" sign from the entrance door and place it aside.
- r.) The door Kirk key must then be inserted into the SRU at SR100 and then turned.
- s.) The searchers must remain at SR100 until the "Time Delays Completed" light comes on, indicating that the warning interval has been successfully completed. The control room operator on duty must then be informed that the X-Ray tunnel has been secured.

## **6.0 Un-secure/Break Security in X-Ray Tunnel**

- 6.1 The machine operator must command all X-Ray main power supplies OFF.
- 6.2 An authorized searcher listed on LS-ESH-0009 must verify that all indicators on the power supply status panel at SR-100 all indicate OFF. If all main power supplies indicate off then the searcher removes the tunnel door key from the SR-100 Solenoid Release Unit (SRU), transfers the key into X-Ray tunnel main entrance door, and opens the door to break security.

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**Figure 1**

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**Document Review  
Frequency**

**3** Years

Review signatures on file  
with master copy of  
controlled document

<b>LIGHT SOURCES DIRECTORATE REVISION LOG</b>		
<b>Document Number:</b>	LS-OPS-0001	
<b>Subject:</b>	Securing the X-Ray Tunnel	
<b>Rev</b>	<b>Description</b>	<b>Date</b>
0	Initial Document	12/15/1997
B	Changed reference for Qualified Searchers to new document LS-ESH-0009 and removed section 6 for qualified searchers. Added the requirement to check the emergency tunnel door during the search - step 5.2(j). Revision changed to letter scheme.	2/1/2002
C	<ul style="list-style-type: none"> <li>• Changed scheme for two check stations from “CS-5 to DG/Start Search” and “CS-4 to CS-E” to be consistent with other systems.</li> <li>• Added instructions on how to Un-secure the X-Ray Tunnel in various sections including a new section 6.0.</li> <li>• Figure 1 changed to illustrate changes in check station scheme.</li> <li>• Changed review frequency from 2 to 3-years.</li> </ul>	7/16/2008